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Incorporating Environmental Risks in Credit Ratings

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Meaningful interactions across multiple channels between our analysts and market participants.

Key Takeaways

- Credit impact of physical climate change is captured in our State and local government methodologies by way of broad rating factors that reflect a government's ability and willingness to repay its debt
- Government's susceptibility to environmental risk will depend on its exposure and resilience to the physical effects of climate change
- We also recognize the variability of exposure by region and other factors that enhance issuer resilience

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Background on Moody's approach to assessing ESG risks in credit analysis

Credit ratings, time horizons and ESG

- We seek to incorporate all relevant credit considerations with the most forward looking view that visibility permits
- However, we do not integrate the impact of long-term risks with great degree of precision given that uncertainty increases as timeframes lengthen

Near-term risks are typically more meaningful and have a more direct impact on ratings

As timeframe lengthens, probability and impact of risks become less certain, as does importance relative to other risks

A longer time frame provides companies with greater capacity to take mitigating (or self-damaging) actions in response to risks

Our ratings capture ESG considerations with material credit implications

Illustrative example of how ESG considerations are incorporated into our corporate credit analysis

ENVIRONMENTAL

SOCIAL

GOVERNANCE

CREDIT ANALYSIS

Assess potential impact on:
- » Product Demand
- » Reputation
- » Cost of Production
- » Financial Strength

METHODOLOGY SCORECARD

Assess material impact under methodology scorecard:
- » Profitability
- » Leverage
- » Cash Flow
- » Business Profile
- » Financial Policy
- » Scale (revenues/assets)

OTHER RATING CONSIDERATIONS

Assess material impact on:
- » Other considerations not captured in methodology scorecard

RATING

Aaa
Aa
A
Baa
Ba
B
Caa
Ca
C

Sources: Moody's Investors Service

Our research highlights ESG themes with broad sector implications

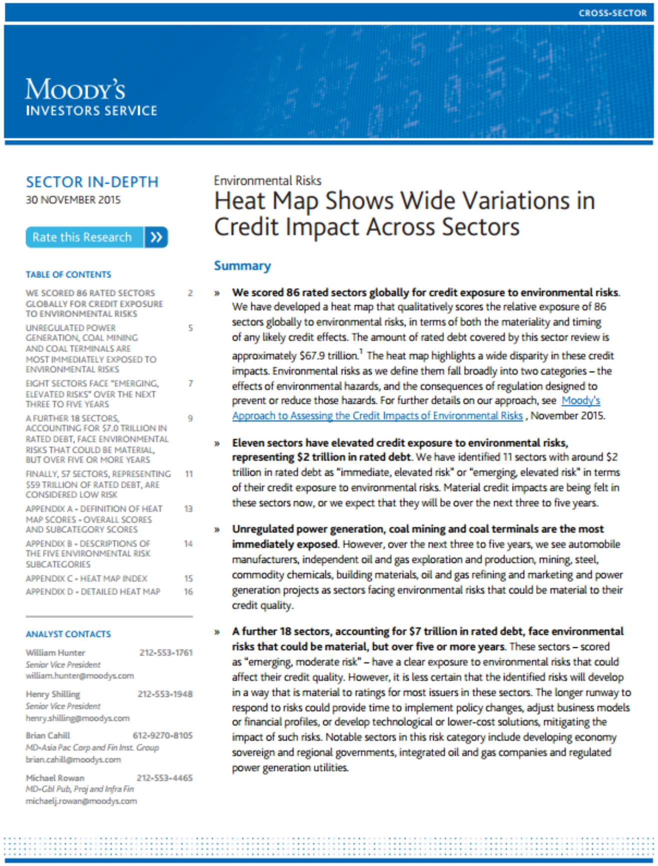
» 2015 study assessed 86 sectors globally ($68trn in rated debt) for credit exposure to five categories of environmental risk

Air Pollution	Soil/Water Pollution & Land Use Restrictions	Carbon Regulations	Water Shortages	Natural & Man-made Disasters
		CO_2		

» These can generally be thought of as "physical risk" and "transition risk"

» Considered both materiality & timing of risks

Immediate, Elevated Risk	Emerging, Elevated Risk	Emerging, Moderate Risk	Low Risk



CROSS-SECTOR

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SECTOR IN-DEPTH
30 NOVEMBER 2015

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Environmental Risks

Heat Map Shows Wide Variations in Credit Impact Across Sectors

Summary

» **We scored 86 rated sectors globally for credit exposure to environmental risks**. We have developed a heat map that qualitatively scores the relative exposure of 86 sectors globally to environmental risks, in terms of both the materiality and timing of any likely credit effects. The amount of rated debt covered by this sector review is approximately $67.9 trillion.[1] The heat map highlights a wide disparity in these credit impacts. Environmental risks as we define them fall broadly into two categories – the effects of environmental hazards, and the consequences of regulation designed to prevent or reduce those hazards. For further details on our approach, see Moody's Approach to Assessing the Credit Impacts of Environmental Risks , November 2015.

» **Eleven sectors have elevated credit exposure to environmental risks, representing $2 trillion in rated debt**. We have identified 11 sectors with around $2 trillion in rated debt as "immediate, elevated risk" or "emerging, elevated risk" in terms of their credit exposure to environmental risks. Material credit impacts are being felt in these sectors now, or we expect that they will be over the next three to five years.

» **Unregulated power generation, coal mining and coal terminals are the most immediately exposed**. However, over the next three to five years, we see automobile manufacturers, independent oil and gas exploration and production, mining, steel, commodity chemicals, building materials, oil and gas refining and marketing and power generation projects as sectors facing environmental risks that could be material to their credit quality.

» **A further 18 sectors, accounting for $7 trillion in rated debt, face environmental risks that could be material, but over five or more years**. These sectors – scored as "emerging, moderate risk" – have a clear exposure to environmental risks that could affect their credit quality. However, it is less certain that the identified risks will develop in a way that is material to ratings for most issuers in these sectors. The longer runway to respond to risks could provide time to implement policy changes, adjust business models or financial profiles, or develop technological or lower-cost solutions, mitigating the impact of such risks. Notable sectors in this risk category include developing economy sovereign and regional governments, integrated oil and gas companies and regulated power generation utilities.

2 Climate Change – Trends vs. Shocks

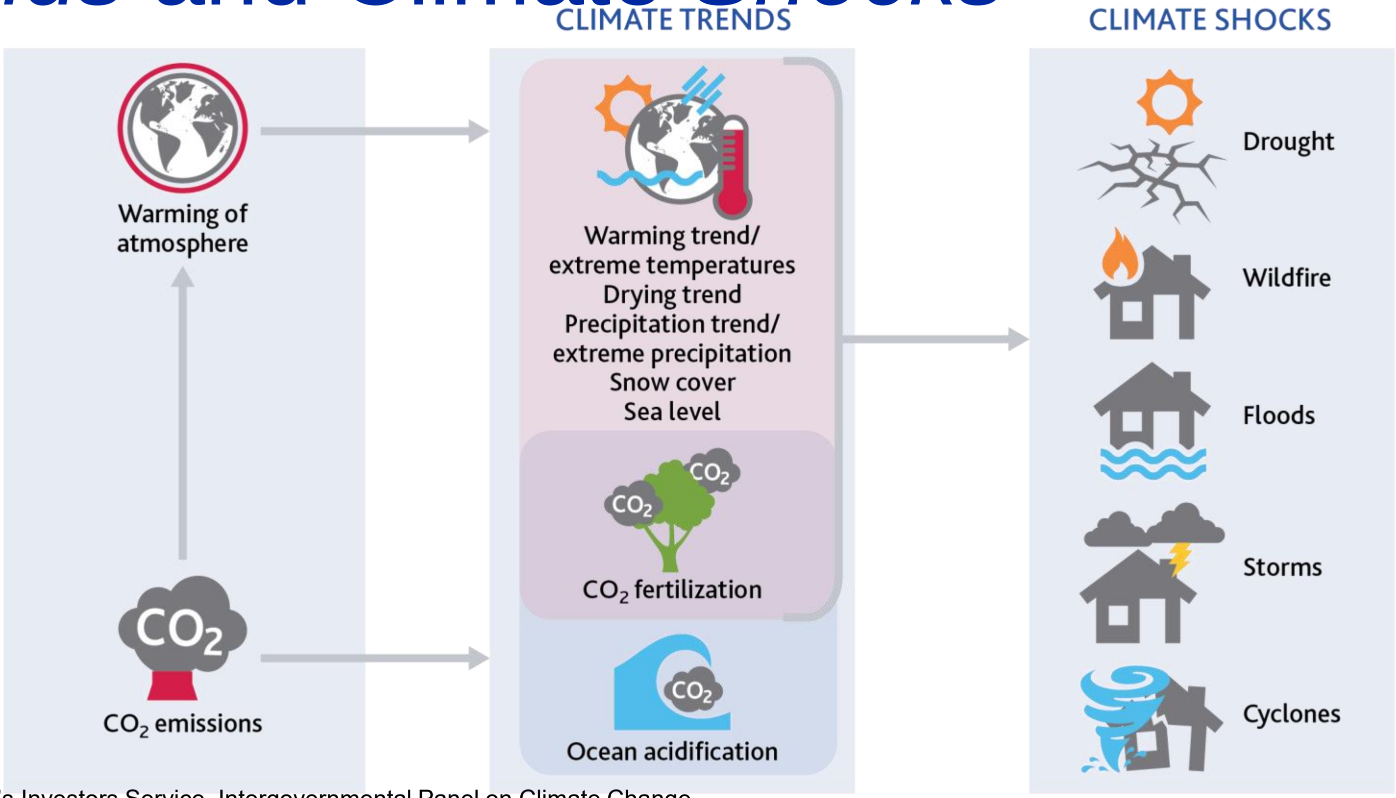
Climate Trends vs Climate Shocks

Incremental climate trends exacerbate extreme climate shocks

» **Climate trend**: Reflect gradual changes in the climate over multiple decades with little visible change from one year to the next, including incremental increases in avg. annual temps., and reduction in cold weather extremes. Changes in climate gradually increase sea levels, create more extreme precipitation patterns and produce more driven weather extremes.

» **Climate Shock**: Refers to extreme weather events such as droughts, floods, wildfire and heat waves that are forecast to increase in frequency and intensity over time due to changing climate.

Physical Effects Manifest as Climate *Trends* and Climate *Shocks*



Source: Moody's Investors Service, Intergovernmental Panel on Climate Change

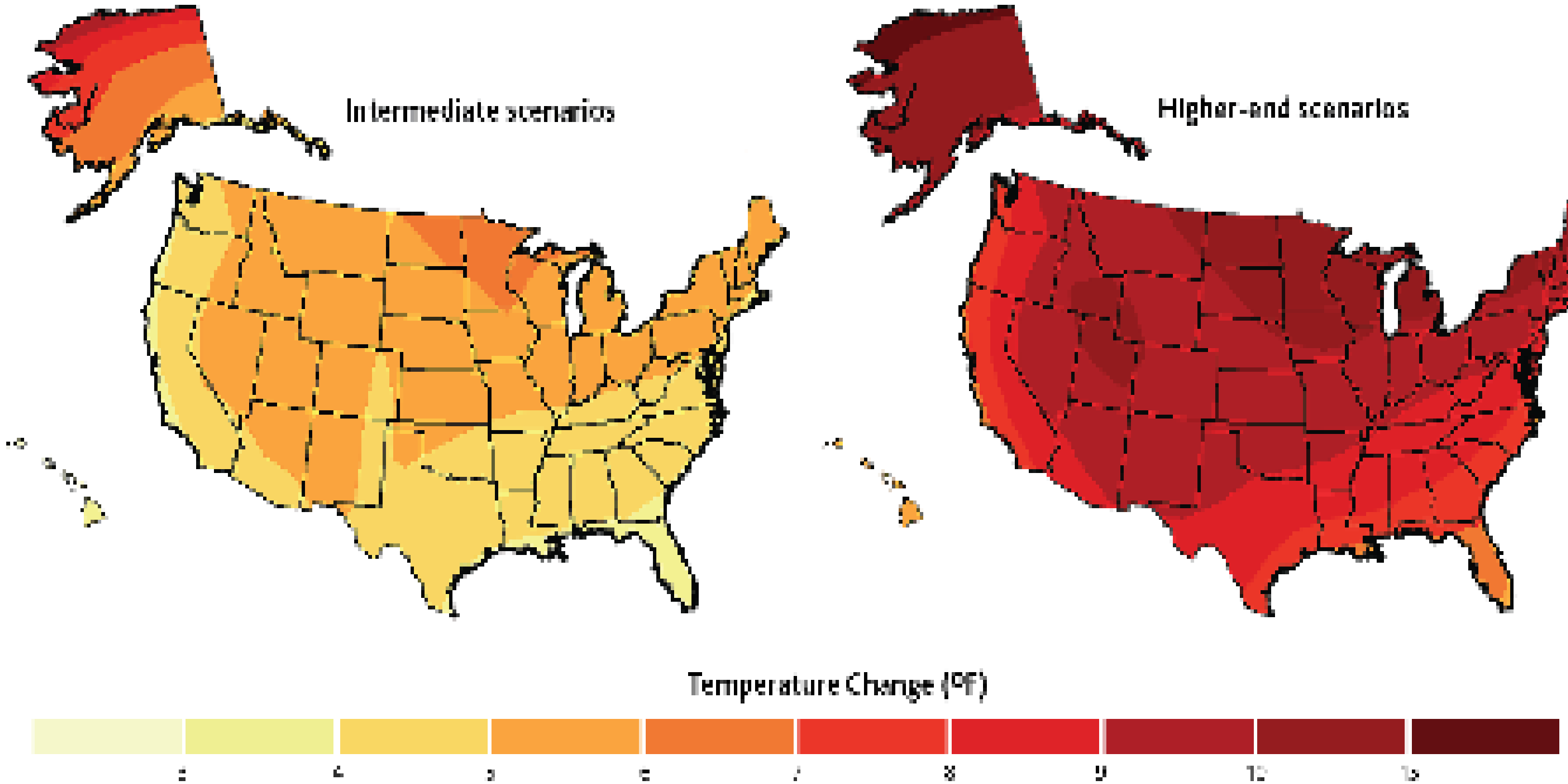
Credit implications of climate trends and shocks will vary depending on time frame and magnitude of impact

3 US Exposure and Vulnerability to Climate Change

US facing increased vulnerability to severe heat and rising sea levels

- **Rising Temperatures**: The National Climate Assessment (NCA), indicates that average US temperatures have risen by 1.3 degrees to 1.9 degrees Fahrenheit since 1895, with the majority of the increase having occurred since 1970.
- **Sea Level Rise:** The National Ocean Service forecasts that global average sea level rise will continue. In 2014, the global average sea level rise was about 2.6 inches above the 1993 average.

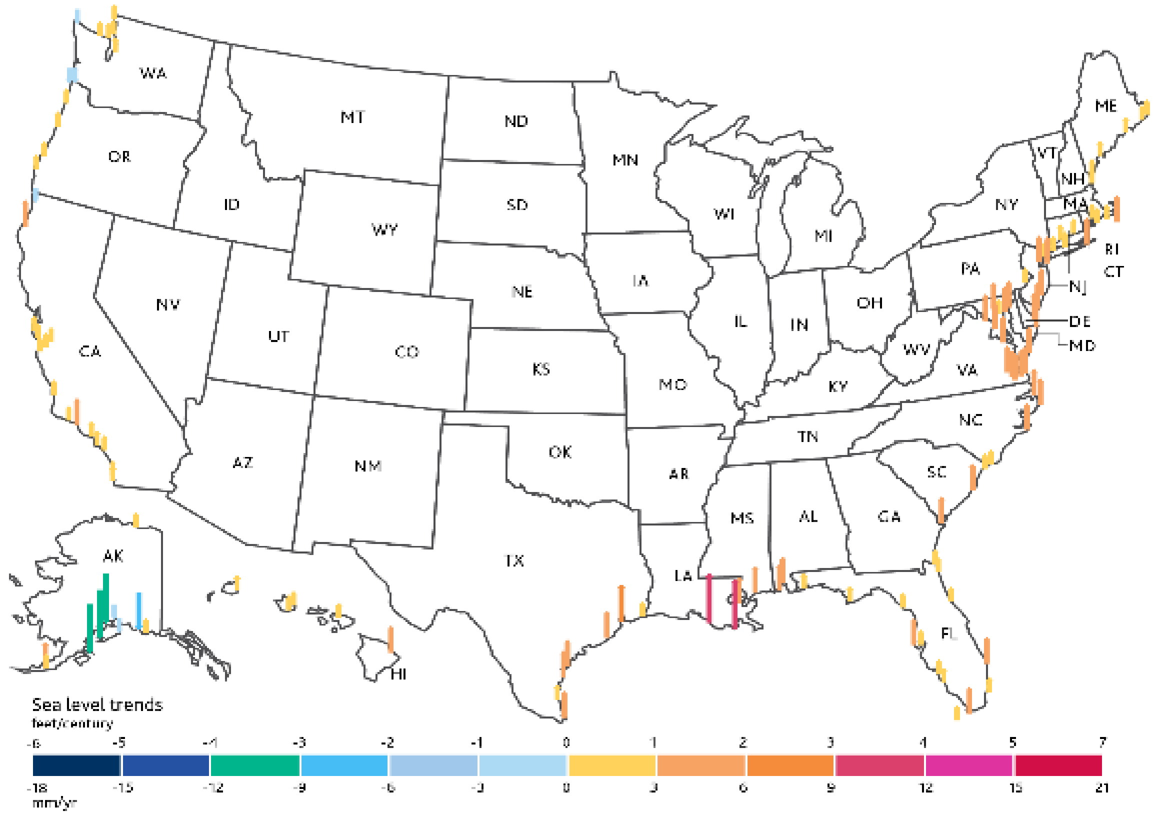
Temperatures forecast to increase depending on future emissions levels



Source: National Climate Assessment

Sea levels have risen

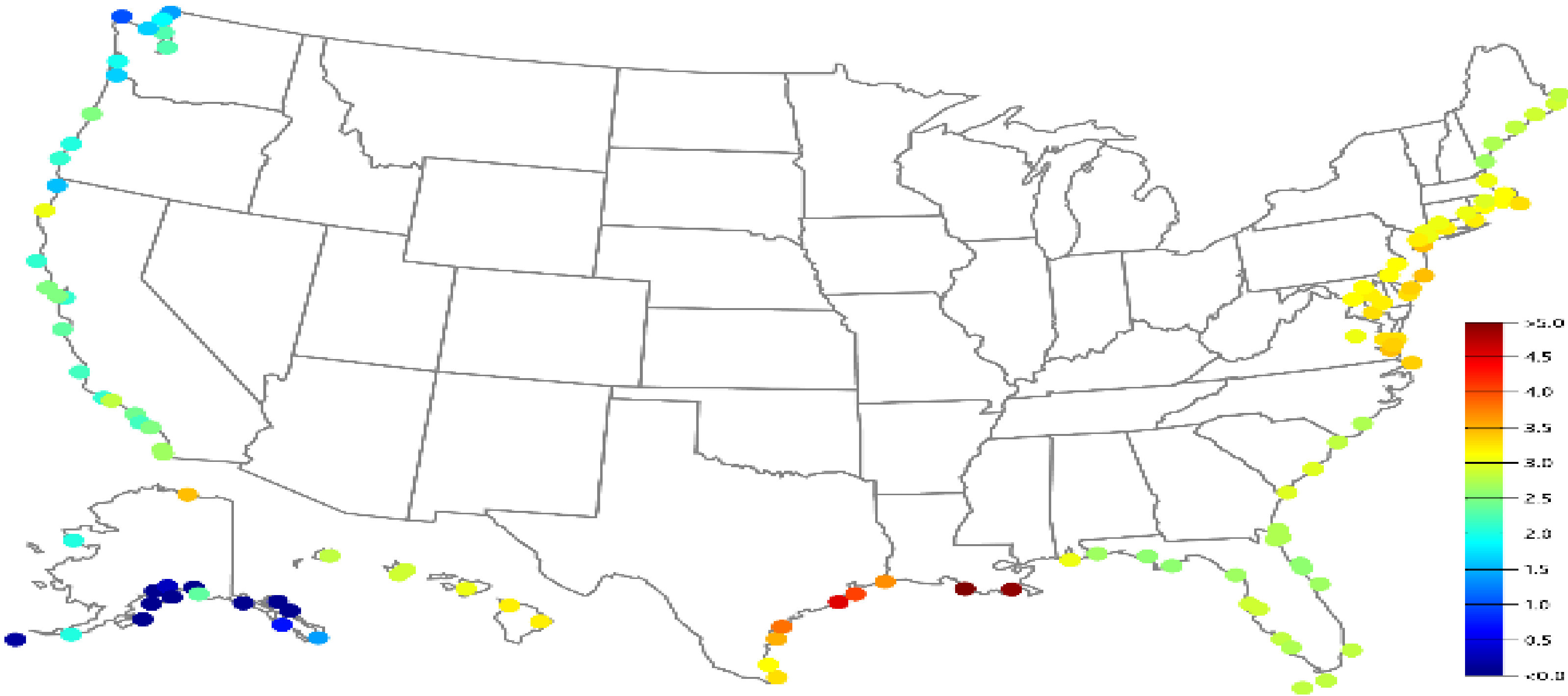
Gulf Coast most acutely affected



Source: National Oceanic and Atmospheric Administration

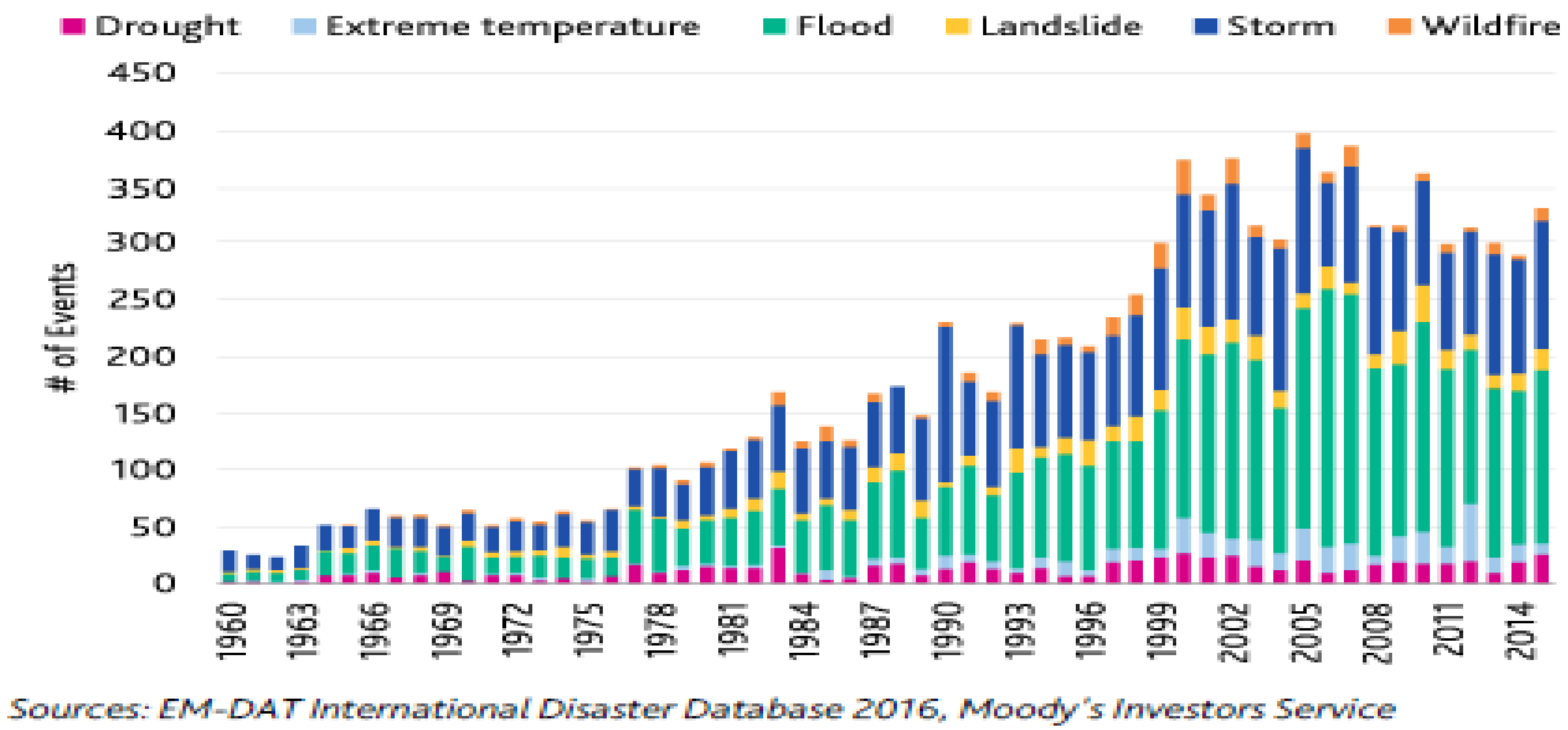
Sea levels forecast to continue to rise through 2100

Gulf Coast projected to be most impacted



Source: Economic Risks of Climate Change: An American Prospectus, by Trevor Houser, Solomon Hsiang, Robert Kopp, Kate Larsen et al (New York: Columbia University Press, 2015). Use by permission of Columbia University Press.

Natural disasters have become more frequent



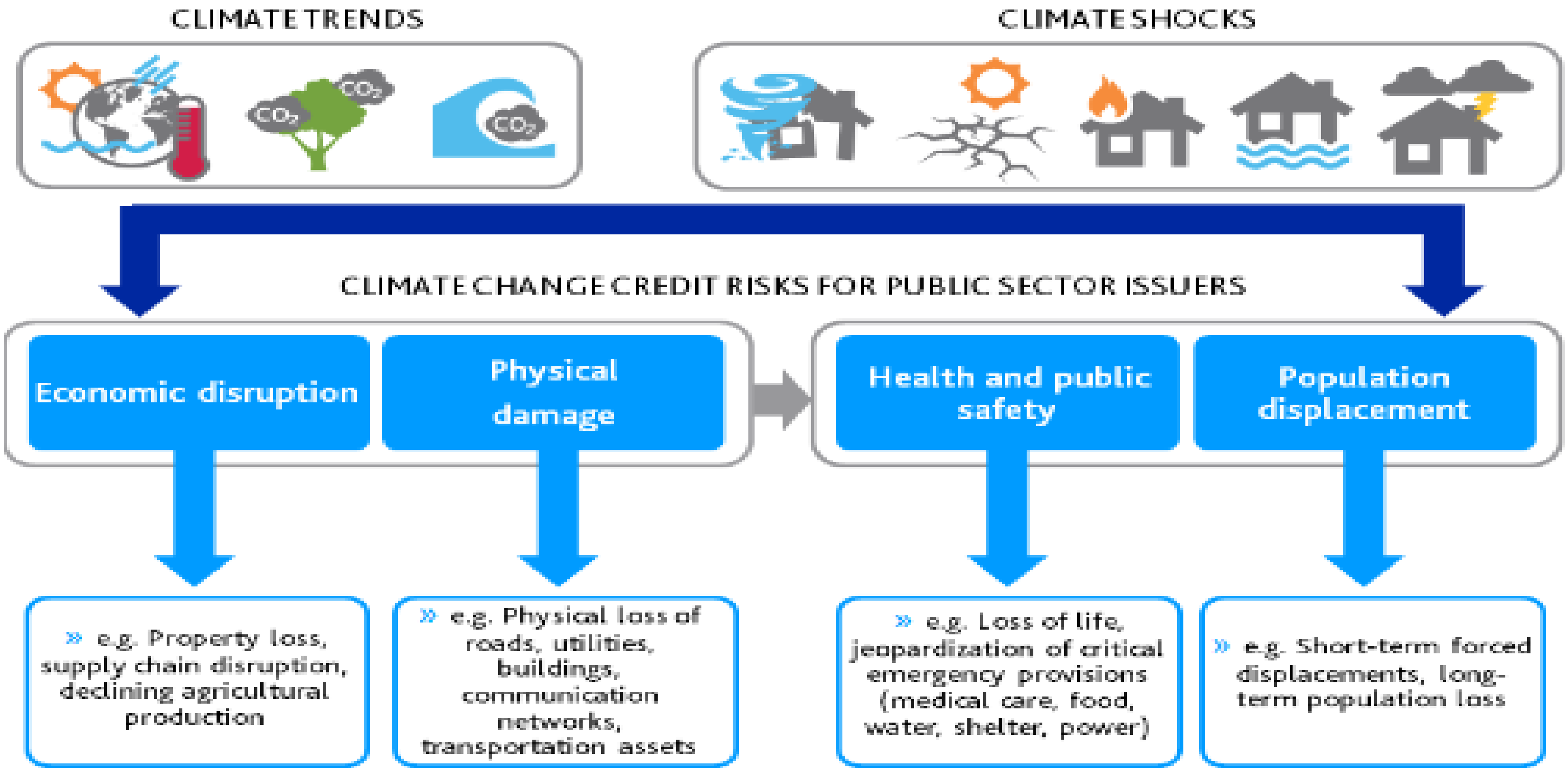
Source: Moody's Investors Service, EM-DAT International Disaster Database

4 Moody's Approach to Analyzing the Credit Risk of Climate Change

Climate risks are embedded in our approach to analyzing the key credit factors in our methodologies

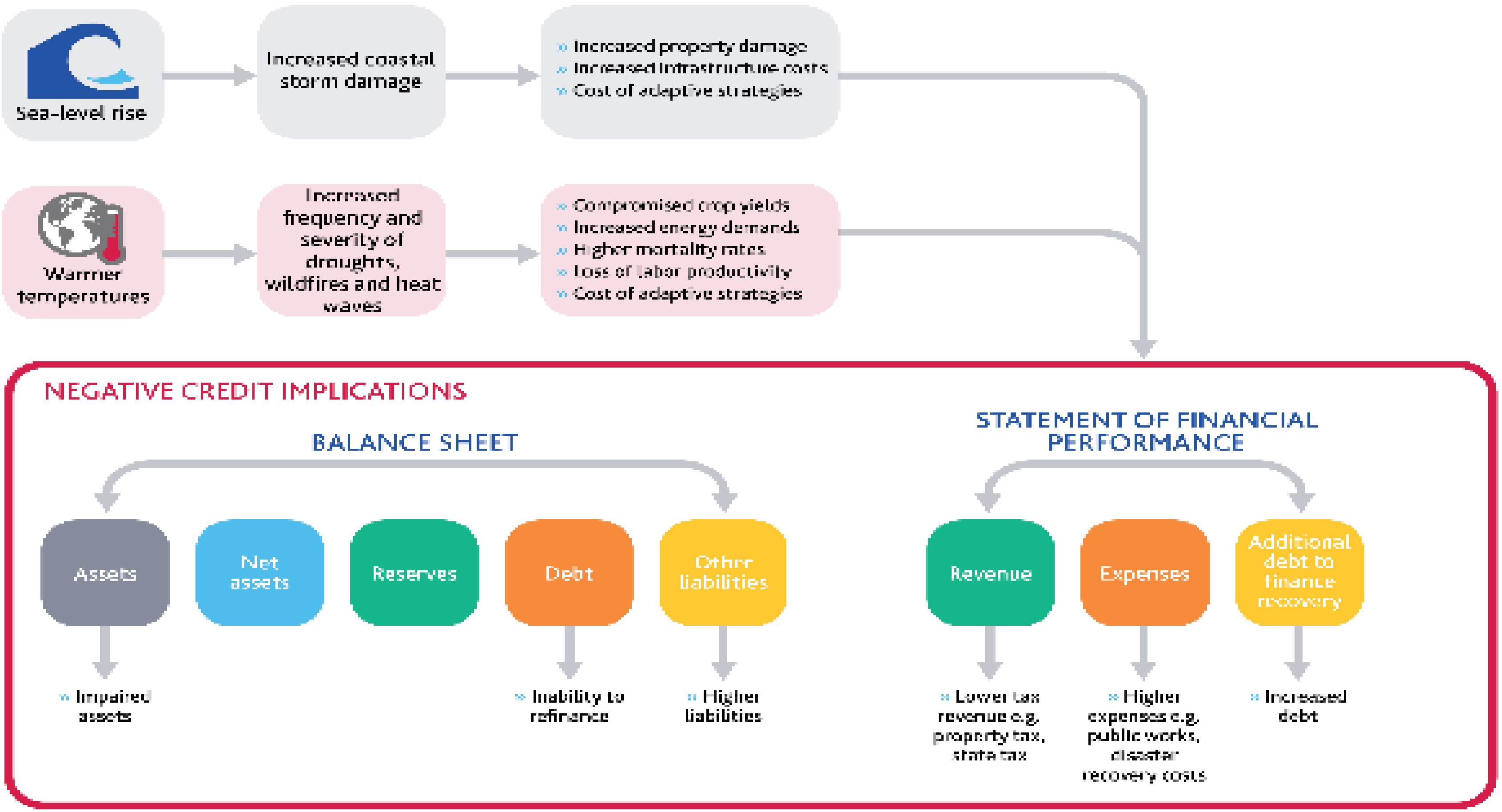
- Our rating methodologies for states, local governments and public utilities do not explicitly address climate change as a credit risk.
- However, the credit challenges of climate change are captured in our analysis of economic strength and diversity, capital asset management, fiscal strength and governance, among other credit factors.
- Local governments facing elevated risk of climate shocks are asked by analysts during the rating process about their preparedness for such shocks and their activities in respect of adapting to climate trends.

We identify the primary public sector issuer credit risks of climate change as:



Source: Moody's Investors Service

Example of how climate risk can be transmitted to credit risk



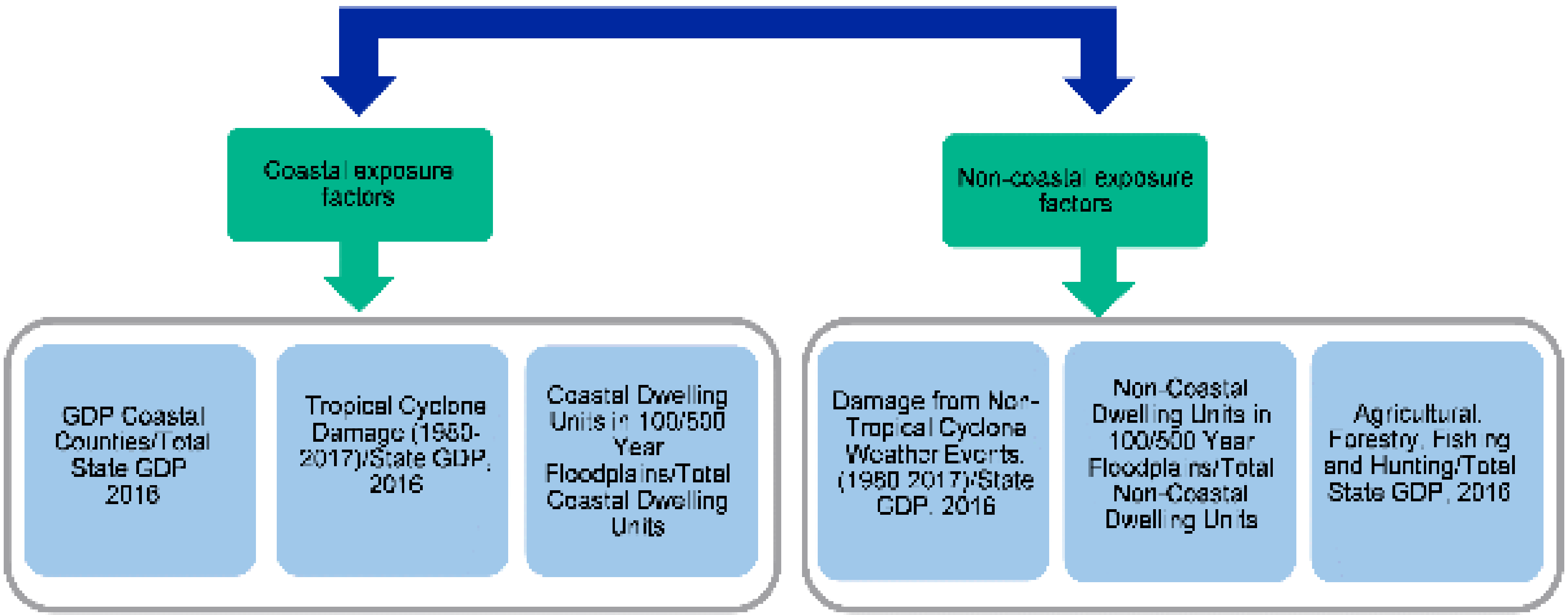
Analysis of key credit factors captures local government resilience

Credit impact of climate risks captured in Local Government General Obligation methodology

- **Economy and Tax Base** (30%): Issuers with economies concentrated in sectors exposed to climate risks face higher credit vulnerability. Small economies that can be disproportionately impacted by climate events are at a heightened risk.
- **Finances**: (30%): Fiscal flexibility can be challenged by unanticipated emergency response costs, infrastructure repair costs, the loss of revenue or the cost of adaptive strategies. Issuers with healthy overall financial positions and strong liquidity are best positioned to service these risks with minimal credit impacts.
- **Management** (20%): Issuers with established and well-developed emergency management, financial, capital and debt plans will be best suited to overcome climate stressors.
- **Debt/Pensions** (20%): Entities with low, manageable debt profiles will benefit from having capacity to incorporate obligations to finance capital improvements.

US states' exposure and overall susceptibility to climate change

Exposure to climate change risks



Source: Moody's Investors Service

5 Long Term and Short Term Issuer Resilience

Local, state and federal tools for immediate response and long-term recovery enhance resilience to credit risks of climate shocks

- The availability of resources at multiple layers of government is an important element that broadens the response capabilities of local issuers and their ability to mitigate credit impacts.
- State governments monitor and evaluate the effectiveness of local response efforts and, if needed, provide both immediate response and long-term recovery assistance.
- Under FEMA, the federal government coordinates the provision of essential emergency response services through a variety of federal agencies. These services include, among others, transportation, communications, public works and engineering, mass care, food, energy, and search and rescue.

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